

REMARKS

The indication of allowable subject matter in claims 9-12 and 16 is acknowledged and appreciated. In view of the following remarks, it is respectfully submitted that all claims are in condition for allowance.

Claims 1 and 13 are independent and stand rejected under 35 U.S.C. § 103 as being unpatentable over Sasagawa et al. '574 ("Sasagawa") in view of Smith et al. '875 ("Smith"). This rejection is respectfully traversed for the following reasons.

Claim 1 recites in pertinent part, "a step of determining a most appropriate area ratio of the layout pattern of a layer according to a design rule of the layer; and a step of adding and arranging a dummy pattern to the layout pattern so that the area ratio of the layer can be the most appropriate area ratio;" and claim 13 recites in pertinent part, "a most appropriate area ratio extracting means for extracting a most appropriate area ratio for forming the pattern of the layer, said most appropriate area ratio being determined according to a design rule of the layer; and a dummy pattern arranging means for calculating an area ratio of the layer from the space area detecting means and arranging a dummy pattern so that the area ratio can be the most appropriate one." According to the present invention, therefore, the dummy pattern can be arranged for the purpose of achieving the most appropriate area.

Turning to the cited prior art, Sasagawa merely discloses a method by which to achieve a uniform-density layout. As noted by the Examiner, Sasagawa does not disclose using dummy patterns to effect the uniform-density layout. Indeed, Sasagawa has no need or desire for dummy fills because it utilizes an iterative-improvement algorithm to redistribute *existing* elements in the layout, *using the initial layout as the initial solution*, to achieve the desired uniform density (see Abstract). In fact, Sasagawa would not want dummy fills because they would interfere with the iterative process in that dummy fills would continuously alter the layout so that the iterations

would no longer be based on the initial layout, but would instead be undesirably dependent on a continually *altered* layout (i.e., with dummy fills). Such a routine would render Sasagawa inoperable for its intended purpose because the disclosed algorithm is designed to effect the desired uniformity based on the initial layout *throughout the iterative process*. In this regard, the disclosed algorithm of Sasagawa would not be able to achieve the desired uniformity because the layout would be altered with dummy fills, for which Sasagawa discloses no protocol. As discussed above, it is respectfully submitted that Sasagawa has no need or desire for using dummy fills, and actually would not desire using dummy fills in the disclosed iterative process.

The Examiner relies on Smith as allegedly disclosing dummy fills for improving density ratios and attempts to modify Sasagawa therewith. However, even assuming *arguendo* that Sasagawa can be properly modified by adding dummy fills, it is respectfully submitted the proposed combination would not disclose or suggest the claimed *combination*.

Contrary to the Examiner's apparent interpretation, Smith does not use pattern density as a parameter by which the dummy fill process is controlled. As expressly disclosed in Figure 18 (step 35), Smith merely discloses dummy fills for achieving the desired *film thickness and electrical parameters*, so that the control over the amount and positioning of the dummy fills is independent of the pattern density. Accordingly, Smith does not suggest using dummy fills in order to achieve a desired density ratio. In fact, the disclosed pattern densities of Smith are simply real-time calculations *during the dummy fill process* used to indicate the ratio of metal to non-metal currently existing in the pattern, so as to emphasize the independence of the control of the dummy fill process from the pattern density.

In fact, Smith expressly discloses that pattern “density is defined as the amount of metal divided by the total area within a given region [such that] adding oxide dummy ... decreases the pattern density” (emphasis added; paragraph [0006]). In this regard, as shown in Figures 1A,B of Smith, the dummy fill simply changes the thickness of the respective pattern rather than the area thereof (this is consistent with the control variables discussed above and shown in Figure 18, step 35 of Smith; i.e., film thickness and electrical parameters).

Accordingly, the pattern density of Smith is completely unrelated to area in terms of definition, as well as its use as an “indicator” in the dummy fill process. In this regard, according to the present invention, placement of *either* dummy oxide and metal would *increase* the area occupied by a pattern, where such placement is geared towards reaching a desired area ratio (i.e., most appropriate area ratio). Accordingly, even assuming *arguendo* proper, the proposed combination would not disclose or suggest the affirmative step of determining a desired area as a parameter by which the dummy fill is effected.

The Examiner is directed to MPEP § 2143.03 under the section entitled "All Claim Limitations Must Be Taught or Suggested", which sets forth the applicable standard for establishing obviousness under § 103:

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. (citing *In re Royka*, 180 USPQ 580 (CCPA 1974)).

In the instant case, the pending rejection does not "establish *prima facie* obviousness of [the] claimed invention" as recited in claims 1 and 13 because the proposed combination fails the "all the claim limitations" standard required under § 103.

Under Federal Circuit guidelines, a dependent claim is nonobvious if the independent claim upon which it depends is allowable because all the limitations of the independent claim are

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contained in the dependent claims, *Hartness International Inc. v. Simplimatic Engineering Co.*, 819 F.2d at 1100, 1108 (Fed. Cir. 1987). Accordingly, as claims 1 and 13 are patentable for the reasons set forth above, it is respectfully submitted that all claims dependent thereon are also patentable. In addition, it is respectfully submitted that the dependent claims are patentable based on their own merits by adding novel and non-obvious features to the combination.

Based on the foregoing, it is respectfully submitted that all pending claims are patentable over the cited prior art. Accordingly, it is respectfully requested that the rejections under 35 U.S.C. § 103 be withdrawn.

CONCLUSION

Having fully responded to all matters raised in the Office Action, Applicants submit that all claims are in condition for allowance, an indication for which is respectfully solicited. If there are any outstanding issues that might be resolved by an interview or an Examiner's amendment, the Examiner is requested to call Applicants' attorney at the telephone number shown below. To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,
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